

Grand Haven, Michigan, 9th, 10th, 17th.
 Marquette, Nebraska, 6th.
 Seward, Nebraska, 26th.
 Yutan, Nebraska, 30th.
 Blackwell, North Carolina, 30th.
 Galveston, Texas, 3d.
 Milwaukee, Wisconsin, 21st, Racine Point, twenty-five miles south of station, being plainly visible.

MISCELLANEOUS PHENOMENA.

SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hundred and sixty-two stations show 4,742 observations to have been made, of which five were reported doubtful; of the remainder, 4,737, there were 3,984, or 84.1 per cent., followed by the expected weather.

SUN SPOTS.

Prof. David P. Todd, director of the Lawrence Observatory, Amherst, Massachusetts, furnishes the following record of sun spots for June, 1885:

Date— June, 1885.	No. of new.		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		Remarks.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
1, 10 a. m.					1	5	6	701	
2, 10 a. m.	0	301	0	0	0	301	5	1201	
3, 4 p. m.	0	201	0	0	0	0	5	1501	
6, 10 a. m.	1	3			1	3	5	801	
8, 10 a. m.							4	601	
9, 12 m.	0	0	1	3	0	0	3	601	
10, 7 p. m.	2	201	1	2	1	2	4	801	One spot very large.
11, 5 p. m.	2	101	0	0	1	3	6	901	Do.
14, 2 p. m.	5	351					8	801	
17, 2 p. m.							10	1701	One spot very large.
19, 6 p. m.					0	0	5	1701	Do.
23, 3 p. m.	2	251					8	1401	

Faculae were seen at the time of every observation. † Approximated.

Prof. L. G. Carpenter, of the Michigan State Agricultural College, Lansing, reports sun-spots during June, as follows: 5th, 3 p. m., six groups, sixty-four spots; 8th, 4.15 p. m., six groups, forty-seven spots; 10th, 8.30 a. m., four groups, forty-four spots; 11th, 2.15 p. m., five groups, forty-six spots; 12th, 9.30 a. m., six groups, fifty-three spots; 16th, 2.30 p. m., nine groups, fifty-five spots; 17th, 4.00 p. m., nine groups, eighty-six spots; 18th, 4.50 p. m., seven groups, sixty-six spots; 19th, 3.30 p. m., five groups, forty-eight spots; 22d, 2.15 p. m., six groups, forty-two spots; 23d, 1.45 p. m., seven groups, fifty-two spots; 29th, 2.45 p. m., eight groups, seventy-one spots; 30th, 3.00 p. m., eight groups, sixty-nine spots.

The following record of sun spots observed on board the American ship "Gatherer," which arrived at San Francisco, California, June 29th, has been received through Commander J. R. Bartlett, U. S. Navy, of the Hydrographic Office:

Date.	Lat. N.	Long. W.	Remarks.
1885.	0	0	
June 9.....	14 21	113 00	Two spots observed on the sun, one on the east side, the other on the upper northwest side.
11.....	16 15	117 45	One spot on the sun.
17.....	28 42	130 00	Spot on east side of sun, going up.
18.....	29 53	131 35	Two spots on the sun, one under and toward the centre, all going up.
19.....	31 14	133 20	Spots on the sun.
20.....	32 11	134 45	Spots shifting to the west side of the sun and growing larger.
21.....	32 27	135 00	Spots all over on the west side of sun.
23.....	35 15	137 00	Spot on the sun well over on west edge.
24.....	35 26	135 36	Spot well on west edge of sun, going off.
26.....	36 58	131 20	Spot seen on the sun, just below centre.
27.....	37 34	129 05	Spot on the sun, most off on the west side.

Mr. H. D. Govey, of North Lewisburg, Champaign county, Ohio, reports having observed sun spots on the following dates: 1st, 2d, 3d, 6th, 9th, 11th, 13th, 14th, 17th, 18th, 19th, 22d, 23d, 24th, 26th, 27th, 29th, 30th.

DROUGHT.

Little Rock, Arkansas, 5th: the weather is very hot and dry; rain is much needed in this vicinity.

Escanaba, Michigan, 7th: farmers from the surrounding country report that the crops are suffering for rain. At Ford River, eight miles south of this station, no rain has fallen since May 25th.

Quakertown, Bucks county, Pennsylvania, 13th: vegetation is suffering in consequence of dry weather; it is estimated that the yield of grain will not exceed half of an average crop.

Maud, Kingman county, Kansas, 30th: the weather during the month was unusually dry; only 0.19 inch of rain fell from the 1st to 19th.

Fallston, Harford county, Maryland: between the 16th and 28th the weather was very dry and crops suffered for rain.

Somerset, Bristol county, Massachusetts: drought prevailed in this vicinity from the 8th to 28th.

Strafford, Orange county, Vermont, 30th: at the close of the month the severest drought was prevailing that has been experienced for eleven years.

New London, Connecticut: during the latter part of the month this region suffered much from drought; at the end of the month grass was burned to the roots and the crops promised but a poor yield.

Wilton Centre, Will county, Illinois, 30th: a drought has prevailed in this county since April 17th; only about three inches of rain fell during the months of May and June.

Blooming Grove, Pike county, Pennsylvania: at the close of the month the soil was very dry and the oat crop suffering for rain.

Embaras, Waupaca county, Wisconsin, 30th: although frequent rains fell during the month in the surrounding country, in this immediate vicinity drought has prevailed.

EARTHQUAKES.

Cahuenga, Los Angeles county, California: at 3.15 a. m. on the 14th a sharp shock of earthquake, of three or four seconds duration, was felt here. The vibration was from east to west.

Los Angeles, California: at about 6.14 p. m. on the 14th an earthquake shock was felt in this city. It was of from two to three seconds duration, the oscillation being apparently from east to west. The shock was sufficient to awaken persons from sleep.

The San Francisco "Daily Alta Californian" of June 15th, contained the following:

SAN BUENA VENTURA, June 14th.—At a quarter past three this morning two shocks of earthquake were felt in this town. They seemed to be from south to north, and lasted about twenty seconds. They were the sharpest shocks felt here for years.

The La Crosse (Wisconsin) "Daily Republican," of June 20th, contained the following:

LONDON, June 20.—Severe shocks of earthquake were experienced this morning at Berne and Geneva, Switzerland. The extent or nature of the damage has not been reported.

Salinas, Monterey county, California: at about 8.30 p. m. on the 25th a slight shock of earthquake was felt here. The vibration was from north to south.

The following is from the "New York Journal of Commerce" of June 26th:

There were several slight shocks of earthquake felt yesterday (June 25) in Invernesshire, Scotland.

Olympia, Washington Territory: at 5.26 a. m. on the 27th a heavy shock of earthquake occurred at this place. It was accompanied by a rumbling noise. The vibration was from east to west.

The following reports have been received from the Signal Service observer at Unalashka, Alaska.

April 13th.—Quite a heavy shock of earthquake, lasting only a few seconds, occurred at 7.20 p. m.

April 30th.—A slight shock of earthquake occurred at 5.30 a. m.

FOREST AND PRAIRIE FIRES.

Manistique, Michigan, 1st: forest fires, twelve miles north-

west of station, began on May 28th, and burned over a tract three miles wide by twelve miles long.

Pike's Peak, Colorado, 5th: forest fires on the north side of the peak, below the timber-line.

Escanaba, Michigan, 8th: forest fires to the east and north of station.

Mount Washington, New Hampshire, 19th: the air was filled with smoke from forest fires.

Prescott, Arizona, 23d.

INSECTS.

Sunman, Ripley county, Indiana: locusts appeared in this vicinity on the 1st.

Vevay, Switzerland county, Indiana, 2d: "the number of seventeen-year locusts is increasing to an alarming extent."

Mount Carmel, Wabash county, Illinois, 6th: swarms of seventeen-year locusts made their appearance on this date; all trees were covered with them.

Guilford (near), Dearborn county, Indiana, 11th: seventeen-year locusts are causing damage to fruit trees.

Merced, Merced county, California, 5th: the orchards, vineyards, and gardens near the foot-hills of the Sierra Nevada and Coast mountain ranges have been completely destroyed by grasshoppers, and in some instances the bark has been eaten from the trees. Late wheat and barley have also suffered much damage.

Cañon City, Fremont county, Colorado, 6th: myriads of young grasshoppers have made their appearance on the south side of the Arkansas river opposite this place.

Little Rock, Arkansas, 6th: reports from northwestern Arkansas state that locusts and grasshoppers have appeared in large numbers.

Chattanooga, Tennessee, 9th: large numbers of locusts have made their appearance on the ridges north of this city, and all kinds of growth are covered with them.

Albion, Edwards county, Illinois: young locusts, in large numbers, began to appear on the 9th at Missouri Point, opposite this place.

Gainesville, Cooke county, Texas, 10th: farmers from the surrounding country report that a species of web-worm has made its appearance in the cotton fields and is causing much damage.

Kalamazoo, Kalamazoo county, Michigan, 12th: the Hessian fly is causing great damage in this county; it is estimated that the wheat crop will be short about 40,000 bushels from this cause.

Princeton, New Jersey, 12th: the seventeen-year locusts have made their appearance in vast numbers here and in central New Jersey, the ground and trees in some localities being completely covered with them.

Elkhart, Elkhart county, Indiana, 13th: seventeen-year locusts have appeared in large numbers in the northwestern part of this county.

Flint, Genesee county, Michigan, 13th: seventeen-year locusts have made their appearance in this vicinity.

New London, Connecticut: potato bugs were first reported in this vicinity on the 13th; the potato crop has been slightly damaged.

Cleburne, Johnson county, Texas, 19th: in some parts of this county the cotton worm has caused great damage.

Cumberland, Maryland: the seventeen-year locusts, which were very numerous during the month, disappeared about the 30th.

Greencastle, Indiana: during the month the seventeen-year locusts appeared in great numbers. The first were observed emerging from the ground May 25th and the last were seen June 15th. The first notes were heard May 30th, the greatest noise from June 10th to 13th, and at the close of the month but few were heard. The heavy rains of the 3d and 4th resulted in killing them in large numbers. Some kinds of trees were badly injured, but fruit trees sustained but slight damage.

METEORS.

Denton, Denton county, Texas: about midnight of the 5-6th

a very brilliant meteor passed over this city, moving from southwest to northwest. It was, apparently, as large or larger than the moon and was visible about thirty seconds. During its flight it changed in color from blue to crimson, and finally to an intense white, making it nearly as light as day. About eight or ten minutes after the disappearance of the meteor a low, rumbling sound was heard.

Greenville, Hunt county, Texas: a meteor passed over this place during the night of the 5-6th; it was accompanied by a roaring sound, and caused considerable alarm.

Pilot Point, Denton county, Texas: at about midnight of the 5-6th; many persons in this vicinity were startled by the sudden appearance of a brilliant light. A few minutes later a loud, roaring sound was heard which caused buildings to shake.

The following are extracts from the "Galveston News" of June 6th:

McKINNEY, June 6.—Last night about midnight a remarkable meteor passed across the sky from northeast to southwest. The light was so bright that a pin could have been seen on the ground, as in daytime. As the light faded out a very loud explosion, followed by a deep, low, rumbling sound, lasting several seconds, took place. It was witnessed and heard by several hundred people in McKinney who had just returned home from Professor Raymond's school exhibition. Several report that while the meteor was passing through the air there was a hissing sound. In size it was reported as varying from the size of a plate to that of a flour barrel.

The light appeared to be of the order of a calcium light. It was seen and heard across the country.

SHERMAN, June 6.—A large meteor, moving in a southwesterly direction, passed over here last night. The whole city was illuminated during its passage, which was fully one-half a minute. A few minutes after its disappearance a loud explosion, similar to heavy artillery, was heard, accompanied with a shock, shaking dwellings and even rattling the glass in the court-house. This was succeeded by a rumbling, as of distant thunder. Different parties who claimed to have seen the celestial visitor estimate its apparent size from the size of a man's head to the size of a cart-wheel. It was also noticed at McKinney, with the same effect.

DALLAS, June 6.—A meteor passed over Dallas at 1 o'clock this morning illuminating the entire city with the splendor of day.

Huntsville, Walker county, Texas: a very brilliant meteor was observed on the 6th; it started from near the North star and fell slowly toward the northwestern horizon.

Chester, Olmstead county, Minnesota: a very brilliant meteor was observed in the northeast at 9 p. m. on the 8th.

West Union, Fayette county, Iowa: at 9 p. m. on the 9th a bright meteor was observed, moving in a northerly direction nearly parallel with the horizon.

Cahuenga, Los Angeles county, California: at 1 a. m. on the 14th a very brilliant meteor was observed in the north-northwest; it fell perpendicularly from an altitude of 30° to within 10° of the horizon, where it exploded, leaving a smoke-like trail, which remained visible about one minute.

Davenport, Iowa: a bright meteor was seen at 8.30 p. m. on the 25th; it started near the southern horizon, moved slowly northward, and disappeared when near the zenith, leaving a bright trail.

Meteors were also observed on the several dates, as follows:

Dover, New Jersey, 3d.
Greenborough, Alabama, 4th.
Lead Hill, Arkansas, 6th.
Bethel, Connecticut, 6th, 8th.
Santa Rosa, California, 7th.
Limona, Florida, 8th.
Prairie du Chien, Wisconsin, 8th.
Rowe, Massachusetts, 9th.
Allison, Kansas, 12th 16th, 17th, 19th, 28th.
Voluntown, Connecticut, 13th.
Webster, Dakota, 13th, 28th.
Stateburg, South Carolina, 14th.
Burlington, Iowa, 14th, 25th.
Somerset, Massachusetts, 15th.
Terre Haute, Indiana, 16th.
Montrose, Colorado, 20th.
Cleburne, Texas, 22d.

POLAR BANDS.

Polar bands were reported during the month by the following stations:

Montrose, Colorado, 21st.
 Wabash, Indiana, 24th.
 Guttenberg, Iowa, 10th, 11th, 22d.
 Mountainville, New York, 1st, 23d.
 Wauseon, Ohio, 2d, 10th.
 Pittsburg, Pennsylvania, 3d.
 El Paso, Texas, 9th 12th.
 Rio Grande City, Texas, 6th, 25th.
 Wytheville, Virginia, 10th, 23d, 26th.
 Dale Enterprise, Virginia, 10th, 29th.
 Bainbridge Island, Washington Territory, 3d.
 Fort Canby, Washington Territory, 7th, 8th.
 Prairie du Chien, Wisconsin, 26th.

SAND STORMS.

Fort Thomas, Arizona, 21st.
 Wickenburg, Arizona, 4th.
 Maricopa, Arizona, 24th.
 Keeler, California, 10th.
 Santa Fé, New Mexico, 5th.

WATER-SPOUTS.

The ship "Union," H. Fokken, commanding, on June 4th, in N. 41° 18', W. 59° 31', saw a large water-spout.

The observer at Key West, Florida, reports that at 12.50 p. m. on the 12th a large but imperfectly formed water-spout was observed about four miles to the north-northwest of that station. It moved rapidly in a southwesterly direction for ten minutes and then broke. A second and smaller water-spout then appeared in the north-northwest; it followed the course of the one first observed for two or three minutes and then broke.

The s. s. "Grip Fast," Captain Burgess, on June 20th, in N. 36° 9', W. 71° 33', saw two water-spouts, one about two miles to the northwest of the vessel and the other about three miles to the southward.

ERRATUM.

In the REVIEW for February, 1885, page 46, under "cautionary signals," in the second line, the number of cautionary signals justified, should read one hundred and fifty instead of one hundred and forty-four; the percentage, 93.75, as published, is correct.

NOTES AND EXTRACTS.

The following extract is from the June, 1885, report of the "Alabama Weather Service," under direction of Prof. P. H. Mell, jr., Auburn:

The month of June has been moderately cool for the season. The thermometer at Calera registered as low as 59°, on the 29th, and 65°, at Mountain View, on the 18th and 30th. This cool wave retarded the growth of the cotton plant to a limited degree, but the injury was slight, and from all quarters of the state good reports are given concerning the crop outlook.

The precipitation was below the normal, but the rainfall was quite evenly distributed throughout the month, and vegetation has not suffered from the lack of moisture. Heavy dews were quite frequent, and the deficiency in rainfall was thus counterbalanced.

Summary.

Mean temperature, 78°.5; highest temperature, 109°, at Livingston, on the 6th; lowest temperature, 54°, at Gadsden, on the 1st; range of temperature, 55°; greatest monthly range of temperature, 43°, at Livingston; least monthly range of temperature, 20°, at La Fayette; mean daily range, 16°.3; greatest daily range of temperature, 44°, at Calera, on the 3d; least daily range of temperature, 2°, at Livingston, on the 26th, and Union Springs, on the 9th.

Mean depth of rainfall, 3.88 inches; mean daily rainfall, 0.126 inch; greatest depth of monthly rainfall, 8.00 inches, at Mount View; least depth of monthly rainfall, 1.23 inches, at Selma; greatest daily rainfall, average for state, 0.48 of an inch, on the 12th; Greatest daily local rainfall, 4.90 inches, at Mount View, on the 12th; days of general rainfall, 8th, 9th, 12th, 16th, 25th; average number of days on which rain fell, 9; average number of cloudy days, 10.3; average number of fair days, 13.9; average number of clear days, 5.8; warmest days, 5th, 6th, 15th; coldest day, 30th.

Prevailing direction of wind, southwest.

Mobile reports that the greatest velocity of wind was 32 miles per hour, from the northeast; Chattanooga, 22 miles, from the northwest; Montgomery, 23 miles, from the northwest; Tuscaloosa, 20 miles, from the southeast.

Thunder-storms were general on the 9th, 13th, 19th, 22d, 24th, 27th, 28th.

The following is an extract from the June, 1885, report of the "Minnesota Weather Service," under direction of Prof. W. W. Payne, of Carleton College, Northfield:

The temperature for June in Minnesota has averaged slightly below the mean; the difference amounting to -0°.3, at Duluth, -2°.0, at Moorhead, -0°.5, at Saint Paul and -0°.8, at LaCrosse. Three well-marked cool terms occurred. The first of these cool waves began on the 7th, when there was a sudden and great fall in temperature at all stations, amounting in most cases to from 30° to 50°. On the morning of the 8th and 9th frosts occurred throughout the state, in some sections to the injury of vegetation, while in others not sufficiently heavy to do any harm. At Park Rapids a minimum temperature of 27°.9 was noted on the 8th, cutting down all tender vegetation, which subsequently recovered. At Saint Paul the temperature fell to 36°.0, the lowest, by 3°.0, for June on record. Cool weather prevailed on the 15th and 16th, and the 20th and 21st. The warmest days were the 1st, 11th, 12th, 13th, 14th, 19th, 20th, 26th and 27th. The maximum temperatures of the month were generally observed on the 18th, 19th and 20th; the lowest minimum being 84°.1, on the 18th, at Saint Vincent and highest 94°.0, on the 20th, at Sherburne, Martin county.

The rainfall for June was in excess of the normal at some stations, while others report a marked deficiency. One station, Milbank, reports less than 2 inches (1.56), and three, Mankato, Park Rapids and Moorhead, over 7 inches, 7.40, 7.50 and 7.92, respectively. The region of greatest rainfall was in the northwestern portion of the state, in the vicinity of Park Rapids, Moorhead, Barnesville and Fergus Falls and the central eastern part of the state, at Waseca and Mankato. The greatest deficiency was, as in May, in the central western portion: Bird Island, 2.03, and Milbank, 1.56 inches. Days of greatest rainfall were the 2d, 3d, 6th, 11th, 12th, 13th, 14th, 18th, 19th, 20th and 25th; rains of one inch and over: Moorhead, 1.26, on the 11th, and 2.60, on the 14th; Saint Paul, 1.17 on the 15th; Duluth, 1.90 on the 12th; Redwing, 2.45, on the 13th; Park Rapids, 11th, 1.41; 12th, 1.60; 13th, 1.00, and 19th, 1.35; La Crosse, 13th, 1.03; Mankato, 2d, 4.50 and 13th, 1.27; Albert Lea, 12th, 1.63; Dodge Centre, 2d, 1.30.

Thunder and hail storms were frequent and destructive during the month. On the 2d, 3d, 6th and 7th great damage was caused in the southern part of the state by hail. At Spring Valley much damage was done to crops and buildings by the severe hail and wind storm of the 7th, which had many of the features of a tornado.

The following is an extract from the June, 1885, bulletin of the "New England Meteorological Society," under direction of Prof. Winslow Upton, Providence, R. I.:

The following discussion of the meteorological conditions for the month is based upon reports from one hundred and thirteen observers, and upon the current publications of the United States Signal Service:

General conditions.—The month was characterized by fair weather, with temperatures a little below the average. It was also a dry month, and in some sections the lack of rain began to have an appreciable effect on vegetation. The abundant rains of the closing days of the month which occurred in some localities, though not in all, somewhat relieved the drought. Numerous thunder-storms and a few high winds were reported.

Precipitation.—A comparison with the records of former years shows a striking irregularity in the distribution of the rain. This irregularity is due to the differences in the distribution of the rain in the storms of the 5th and 29th-30th, for, while rain was general in both of these storms, there was great discordance in the amounts which fell even at places in the same locality, especially in the latter storm. Thus, at Fitchburg, Massachusetts, the amount reported was 0.22 inch., and at Petersham 0.25 inch., but at Lawrence and Lowell, Massachusetts, the amounts were 1.77 and 2.24 inches, respectively, while New Bedford received 3.28, and Cotuit 3.55 inches. In New Hampshire and Vermont similar peculiarities were noted; thus, in New Hampshire: Hanover, 0.56, and Concord, 2.77 inches; in Vermont, Dorset, 0.50, and Lunenburg, 2.03 inches. In Maine the amounts were all large, and in some cases an enormous excess is reported, as Eastport, 2.35, Sebago Lake, 2.97, Gardiner, 3.82 inches. Newspaper reports give the extraordinary amount of 7.50 inches at Augusta, and our observer at Mayfield reports 8.00 inches. There can be no question but that the distribution in this storm was of unusual irregularity, and that very excessive amounts fell in certain localities. The reports show a wide divergence in the comparison of the records with those of past years, which is due to the above cause. The amount of rain at Mount Washington is large, but has been exceeded in several years, the greatest amount for June, 18.46 inches, having been noted in 1872. Snow fell on three days at Mount Washington; on the 24th, Mount Lafayette, New Hampshire, was covered with snow, and on the 9th a slight amount fell at Saint John, New Brunswick. Hail was noted at Albany, New York, on the 9th.

Temperature.—The temperature record presents no unusual characteristics. The monthly average is somewhat below that of former years, with but few exceptions. No unusually high temperatures were noted, though at many stations the temperature was above 90° on one or two days. Cool weather was frequent in the early days of the month, and light frosts were numerous on the 6th, 9th, and 10th. No serious damage to crops was reported.

Pressure.—The fluctuation of the pressure was about as usual, but the monthly average is low, especially in Maine. Five depressions moved near, or over, the district, two passing directly over Massachusetts. All of these approached from the lake region, moving easterly. Their dates were 1st, 5th,